WHAT IS CLAIMED IS:

1. A system for determining a dielectric property associated with a substrate, comprising:

a network analyzer for measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range;

a first engine for determining a complex propagation constant based on said scattering parameters and defining said complex propagation constant in terms of an attenuation component and a phase component;

a second engine, responsive to said phase component, for determining a relative permittivity parameter associated with said substrate over said specified frequency range; and

a third engine, responsive to said attenuation component and said relative permittivity parameter, for performing a least squares analysis to determine a loss tangent parameter associated with said substrate over said specified frequency range.

2. The system as recited in claim 1, wherein said specified frequency range comprises a range from about 300 KHz to about 8.5 GHz.

3. The system as recited in claim 1, wherein said at least two lines of identical cross-section comprise striplines of varying lengths.

4. The system as recited in claim 1, wherein said at least two lines of identical cross-section comprise microstrips of varying lengths.

5. The system as recited in claim 1, wherein said network analyzer comprises two probes that contact one of said at least two lines of substantially identical cross-section via platted through holes (PTHs) coupled to said one of said at least two lines.

6. The system as recited in claim 1, wherein said network analyzer comprises two probes that contact one of said at least two lines of substantially identical cross-section via subminiature version A (SMA) connections coupled to said one of said at least two lines.

7. The system as recited in claim 1, wherein said loss tangent parameter is utilized in determining said substrate's dielectric constant.

8. The system as recited in claim 1, wherein said complex propagation constant is determined for a substrate comprising a printed circuit board (PCB).

9. The system as recited in claim 1, wherein said complex propagation constant is determined for a substrate comprising a fire retardant (FR)-4 material.

10. A method for determining a dielectric property associated with a substrate, comprising:

measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range;

determining a complex propagation constant based on said scattering parameters;

defining said complex propagation constant in terms of an attenuation component and a phase component;

based on said phase component, determining a relative permittivity parameter associated with said substrate over said specified frequency range; and

based on said attenuation component and said relative permittivity parameter, performing a least squares analysis to determine a loss tangent parameter associated with said substrate over said specified frequency range.

11. The method as recited in claim 10, wherein the operation of measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range further comprises measuring said scattering parameters over a frequency range from about 300 KHz to about 8.5 GHz.

12. The method as recited in claim 10, wherein the operation of measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range further comprises selecting said at least two striplines of identical cross-section having varying lengths.

13. The method as recited in claim 10, wherein the operation of measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range further comprises selecting at least two microstrips of identical cross-section having varying lengths.

14. The method as recited in claim 10, wherein the operation of measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range further comprises probing said at least two lines via platted through holes (PTHs) coupled to said one of said at least two lines.

15. The method as recited in claim 10, wherein the operation of measuring scattering parameters for at least two lines of substantially identical cross-section embedded within said substrate over a specified frequency range further comprises probing said at least two lines via subminiature version A (SMA) connections coupled to said one of said at least two lines.

16. The method as recited in claim 10, further comprising determining said substrate's dielectric constant based on said loss tangent parameter.

17. A system for analyzing a substrate, comprising:

a network analyzer;

first and second probes coupled to said network analyzer, said first and second probes being operable to perform *in-situ* measurements of scattering parameters for at least two lines of substantially identical cross-section associated with said substrate over a specified frequency range; and

means associated with said network analyzer, responsive to said *in-situ* measurements of scattering parameters, for determining a loss tangent associated with said substrate by utilizing a cascade representation of uniform transmission to model said substrate and a complex propagation constant associated therewith.

18. The system as recited in claim 17, wherein said specified frequency range comprises a range from about 300 KHz to about 8.5 GHz.

19. The system as recited in claim 17, wherein said at least two lines of substantially identical cross-section are selected from the group consisting of striplines and microstrips.

20. The system as recited in claim 17, wherein said means associated with said network analyzer is operable to determine a loss tangent associated with a substrate comprising a printed circuit board (PCB).

21. The system as recited in claim 17, wherein said loss tangent is utilized in determining said substrate's dielectric constant.

22. The system as recited in claim 17, wherein said means associated with said network analyzer is operable to generate a graph of said loss tangent versus frequency over said specified frequency range.

23. The system as recited in claim 17, wherein said means associated with said network analyzer is operable to generate a graph of relative permittivity versus frequency over said specified frequency range.